FORM PTO-1390
REV. 5-93

US DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEYS DOCKET NUMBER
P00,1571

U.S.APPLICATION NO. (if known, see 37 CFR 1.5)
09/622807

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/01317	1 March 1999	27 February 1998

TITLE OF INVENTION
"RELAYING IN A TELECOMMUNICATIONS SYSTEM BASED ON CODE AND TIME-DIVISION MULTIPLEX"

APPLICANT(S) FOR DO/EO/US
Erich KAMPERSCHROER and Uwe SCHWARK

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2).

7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).)

10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C.371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**

12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. **(SEE ATTACHED ENVELOPE)**

13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ A change of power of attorney and/or address letter.

16. ☒ Other items or information:
    a. ☒ Submittal of Drawings
    b. ☒ **EXPRESS MAIL #EJ220501681 US, dated August 22, 2000.**

U.S. APPLICATION NO (if known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/622807	PCT/EP99/01317	P00,1571

534 Rec'd PCT/PTO 22 AUG 2000

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO . . . . . $840.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $700.00 No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) . . . . . $770.00 Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO . . . . . $1040.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	10 - 20 =		X $ 18.00	$ .00	
Independent Claims	1 - 3 =		X $ 78.00	$ .00	
Multiple Dependent Claims			$260.00 +	$	
			TOTAL OF ABOVE CALCULATIONS =	$ 840.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
			SUBTOTAL =	$ 840.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
			TOTAL NATIONAL FEE =	$ 840.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +					
			TOTAL FEES ENCLOSED =	$ 840.00	
			Amount to be refunded	$	
			charged	$	

a. ☒ A check in the amount of $ 840.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2290. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Schiff Hardin & Waite
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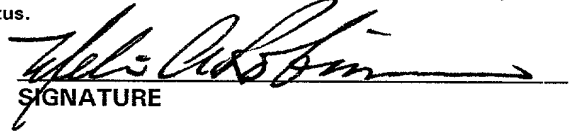
6600 Sears Tower
Chicago, Illinois 60606



SIGNATURE

Melvin A. Robinson
NAME

31,870
Registration Number

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"**PRELIMINARY AMENDMENT**"

APPLICANT: Erich KAMPERSCHROER et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/EP99/01317

INTERNATIONAL FILING DATE: 1 March 1999

INVENTION: RELAYING IN A TELECOMMUNICATIONS SYSTEM BASED ON CODE AND TIME-DIVISION MULTIPLEX

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

SIR:

Amend the above-identified international application before entry into the national stage before the U.S. Patent & Trademark Office under 35 U.S.C. §371 as follows:

IN THE CLAIMS

In claim 3, line 1, change "1 oder 2" to --1--.

In claim 6, line 1, change "Ansprüche 1 bis 5" to --Anspruch 1--.

In claim 8, line 1, delete "oder 7".

In claim 10, line 1, change "Ansprüche 1 bis 9" to --Anspruch 1--.

REMARKS

The foregoing amendments to the claims remove the multiple dependancies so that each dependant claim depends from a single claim. Accordingly, entry of these amendments before examination on the merits is hereby requested.

Respectfully submitted,

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ATTORNEY FOR APPLICANT

TELECOMMUNICATION SYSTEMS WITH WIRELESS TELECOMMUNICATION BETWEEN MOBILE AND/OR STATIONARY TRANSMISSION/RECEPTION DEVICES BASED ON CODE-DIVISION AND TIME-DIVISION MULTIPLEX

Telecommunication systems with wireless telecommunication between mobile and/or stationary transmission/reception devices are specific message systems having a message transmission link between a message source and a message sink wherein, for example, base stations and mobile parts for message processing and transmission are employed as transmission and reception devices, and wherein

1) the message processing and message transmission can ensue in a privileged transmission direction (simplex mode) or in both transmission directions (duplex mode),

2) the message processing is preferably digital,

3) the message transmission via the long-distance transmission link ensues wirelessly on the basis of various message transmission methods for multiple utilization of the message transmission link FDMA (**F**requency **D**ivision **M**ultiple **A**ccess), TDMA (**T**ime **D**ivision **M**ultiple **A**ccess) and/or CDMA (**C**ode **D**ivision **M**ultiple **A**ccess) -- for example, according to radio standards such as **DECT** [**D**igital **E**nhanced (previously: **E**uropean) **C**ordless **T**elecommunication; see *Nachrichtentechnik Elektronik 42 (1992) Jan./Feb., No. 1, Berlin, DE; U. Pilger, "Struktur des DECT-Standards" pages 23 through 29* **in combination with** the ETSI Publication *ETS 300175-1...9, October* 1992 and the DECT publication of *DECT-Forum, February 1997, pages 1 through 16*], **GSM** [**G**roupe **S**péciale **M**obile or **G**lobal **S**ystem for **M**obile Communication; see *Informatik Spektrum 14 (1991), June, No. 3, Berlin, DE; A. Mann, "Der GSM-Standard -- Grundlage für digitale europäische Mobilfunknetze", pages 137 through 152* **in combination with** the publication *telekom praxis 4/1993, P. Smolka "GSM-Funkschnittstelle -- Elemente und Funktionen", , pages 17 through 24*], **UMTS** [**U**niversal **M**obile **T**elecommunication **S**ystem; see **(1)**: *Nachrichtentechnik Elektronik, Berlin 45, 1995, No. 1, pages 10-14 and No. 2, pages 24-27; P. Jung, B. Steiner, "Konzept eines*

CDMA-Mobilfunksystems mit gemeinsamer Detektion für die dritte Mobilfunkgeneration"; **(2)**: *Nachrictentechnik Elektronik, Berlin 41, 1991, No. 6, pages 223-227 and page 234; P. W. Baier, P. Jung, A. Klein, "CDMA -- ein günstiges Vielfachzugriffsverfahren für frequenzselektive und zeitvariante Mobilfunkkanäle"*; **(3)**: *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, Vol. E79-A, No. 12, December 1996, pages 1930-1937; P. W. Baier, P. Jung, "CDMA Myths and Realities Revisited"*; **(4)**: *IEEE Personal Communications, February 1995, pages 38-47; A. Urie, M. Streeton, C. Mourot, "An Advanced TD MA Mobile Access System for UTMS"*; **(5)**: *telekom praxis, 5/1995, pages 9-14; P. W. Baier, "Spread-Spectrum-Technik und CDMA -- eine ursprünglich militärische Technik erobert den zivilen Bereich"*; **(6)**: *IEEE Personal Communications, February 1995, pages 48 through 53; P. G. Andermo, L. M. Ewerbring, "An CDMA-Based Radio Access Design for UMTS"* ; **(7)**: *ITG Fachberichte 124 (1993), Berlin, Offenbach, VDE Verlag ISBN 3-8007-1965-7, pages 67-75; Dr. T. Zimmermann, Siemens AG, "Anwendung von CDMA in der Mobilkommunikation"*; **(8)**: *telcom report 16, (1993), No. 1, pages 38-41; Dr. T. Ketseoglou, Siemens AG and Dr. T. Zimmermann, Siemens AG, "Effizienter Teilnehmerzugriff für die 3. Generation der Mobilkommunikation -- Vielfachzugriffsverfahren CDMA macht Luftschnittstelle flexibler"*; **(9)**: *Funkschau 6/98, R. Sietmann, "Ringen um die UMTS-Schnittstelle", pages 76-81*] WACS or PACS, IS-54, IS-95, PHS, PDC, etc. [see IEEE Communications Magazine, January 1995, pages 50-57; D. D. Falconer et al., "Time Division Multiple Access Methods for Wireless Personal Communications"].

"Message" is a higher-ranking term that stands both for the meaning (information) as well as for the physical representation (signal). Despite the same meaning of a message -- i.e. the same information --, different signal forms can occur. Thus, for example, a message relating to a subject can be transmitted

(1) in the form of an image,

(2) as a spoken word,

(3) as a written word,

(4) as an encrypted word or image.

The type of transmission according to (1)...(3) is thereby normally characterized by continuous (analog) signals, whereas discontinuous signals (for example, pulses, digital signals) usually arise given the type of transmission according to (4).

The following Figures 1 through 7 show:

Figure 1 "three-layer structure" of a WCDMA/FDD radio interface in the "downlink";

Figure 2 "three-layer structure" of a WCDMA/FDD radio interface in the "uplink";

Figure 3 "three-layer structure" of a TDCDMA/TDD radio interface;

Figure 4 radio scenario with channel multiple-use according to frequency-division, / time-division, / code-division multiplex;

Figure 5 the basic structure of a base station fashioned as transmission/reception device;

Figure 6 the basic structure of a mobile station likewise fashioned as transmission/reception device;

Figure 7 a DECT transmission time frame.

In the UMTS scenario (3rd mobile radiotelephone generation or, respectively, IMT-2000), there are two sub-scenarios, for example according to the publication *Funkschau 6/98, R. Sietmann, "Ringen um die UMTS-Schnittstelle", pages 76-81.* In a first sub-scenario, the licensed, coordinated mobile radiotelephone will be based on a WCDMA technology (**W**ideband **C**ode **D**ivision **M**ultiple **A**ccess) and, as in GSM, will operate in the FDD mode (**F**requency **D**ivision **D**uplex), whereas the unlicenced, uncoordinated mobile radiotelephone in a second sub-scenario will be based on a TD-CDMA technology (**T**ime **D**ivision-**C**ode **D**ivision **M**ultiple **A**ccess) and, as in DECT, will operate in the TDD mode (**F**requency **D**ivision **D**uplex)

For the WCDMA/FDD mode of the universal mobile telecommunication system, the radio interface of the telecommunication system respectively contains a plurality of physical channels in upstream and downstream direction according to the publication *ETSI STC SMG2 UMTS-L1, Tdoc SMG2 UMTS-L1 163/98, "UTRA Physical Layer Description FDD Parts", Vers. 0.3, 1998-05-29*, a first physical channel thereof, what is referred to as the **D**edicated **P**hysical **C**ontrol **CH**annel

DPCCH, and a second physical channel thereof, what is referred to as the **D**edicated **P**hysical **D**ata **CH**annel DPDCH, [...] with reference to a "three-layer structure" composed of 720 ms long (T_{FZR}=720ms) super frames MZR, 10 ms long (T_{FZR}=10 ms) radio frames ZR and 0.625 ms long (T_{ZS}=0.625 ms) time slots ZS that are shown in Figures 1 and 2. The respective super frame MZR contains, for example, 72 radio frames, whereas each radio frame ZR in turn comprises, for example, 16 time slots ZS1...ZS16. As burst structure with respect to the first physical channel DPCCH, the individual time slot ZS, ZS1...ZS16 (burst) comprises a pilot sequence PS with N_{pilot} bits for channel estimating, a TPC sequence TPCS with N_{TPC} bits for traffic power control and a TFC1 sequence TFCIS with N_{TFCI} bits for traffic format channel indication as well as a payload data sequence NDS with N_{Data} bits with respect to the second physical channel DPDCH.

The first physical channel ["dedicated physical control channel (DPCCH)] and the second physical channel ["dedicated physical data channel (DPDCH)] are time-multiplexed in the downlink (downstream direction of the telecommunication; radio connection from the base station to the mobile station) of the WCDMA/FDD system of ETSI or, respectively, ARIB – Figure 1 –, whereas an I/Q multiplex wherein the second physical channel DPDCH is transmitted in the I-channel and the first physical channel DPCCH is transmitted in the Q-channel occurs in the uplink (upstream direction of the telecommunication; radio connection from the mobile station to the base station) – Figure 2.

According to the publication, *TSG RAN WG1 (S1.21): "3rd Generation Partnership Project (3GPP)", Vers. 0.0.1, 1999-01*, the radio interface of the telecommunication system in upstream and downstream direction of the telecommunication for the TDCDMA/TDD mode of the universal mobile telecommunication system is again based on the "three-layer structure" composed of the super frame MZR, the radio frame ZR and the time slots ZS for all physical channels that is shown in Figure 3. The respective super frame MZR again contains, for example, 72 radio frames ZR, whereas each radio frame ZR again, for example, comprises the 16 time slots ZS, ZS1,...ZS16. The individual time slot ZS, ZS1...ZS16 (burst) either comprises – according to the ARIB proposal – a first time slot structure

(burst structure) ZSS1 composed, in sequence, of a first payload data sequence NDS1 with N_{Data1} bits, of the pilot sequence PS with N_{pilot} bits for channel estimating, of the TCP sequence TPCS with N_{TPC} bits for power control, of the TFCI sequence TFCIS with N_{TFCI} bits for transport format indication, of a second payload data sequence NDS2 and of a guard period having N_{Guard} bits or – according to the ETSI proposal – a second time slot structure (burst structure) ZSS2 composed, in sequence, of the first payload data sequence NDS1, of a first TFCI sequence TFCIS1, of a midamble sequence MIS for channel estimating, of a second TFCI sequence TFCIS2, of the second payload data sequence NDS2 and of the guard time SZZ.

On the basis of, for example, a GSM radio scenario with, for example, two radio cells and base stations (**B**ase **T**ransceiver **S**tation) arranged therein, Figure 4 shows [...], whereby a first base station BTS1 (transmitter/receiver) omnidirectionally "illuminates" a first radio cell FZ1 and a second base station omnidirectionally "illuminates" a second radio cell, and, proceeding from Figures 1 and 2, a radio scenario with channel multiple utilization according to the frequency-division/time-division/code-division multiplex, whereby the base stations BTS1, BTS2 are connected or, respectively, connectable – via a radio interface designed for the radio scenario – to a plurality of mobile stations MS1...MS5 (transmission/reception device) located in the radio cells by wireless unidirectional or bidirectional – downstream direction UL (uplink) and/or downstream direction DL (downlink) – telecommunication on corresponding transmission channels TRC. The base stations BTS1, BTS2 are connected in a known way (see GSM telecommunication system) to a base station controller BSC that assumes the frequency management and switching functions in the framework of the control of the base stations. The base station controller BSC is in turn connected via a mobile switching center MSC to the higher-ranking telecommunication network, for example the PSTN (public switched telecommunication network). The mobile switching center MSC is the administration center for the illustrated telecommunication system. It assumes the complete call administration and – with associated registers (not shown) – the authentification of the telecommunication subscribers as well as the location monitoring in the network.

Figure 5 shows the fundamental structure of the base station BTS1, BTS2 fashioned as transmission/reception device, whereas Figure 6 shows the basic structure of the mobile station MS1...MS5 likewise fashioned as transmission/reception device. The base station BTS1, BTS2 assumes the sending and receiving of radio messages from and to the mobile station MS1...MS5, whereas the mobile stations MS1...MS5 assumes the sending and receiving of radio messages from and to the base station BTS1, BTS2. To this end, the base station comprises a transmission antenna SAN and a reception antenna EAN, whereas the mobile station MS...MS5 comprises an antenna ANT shared for sending and receiving that can be controlled by an antenna switchover means AU. In the upstream direction (reception path), the base station MTS1, BTS2 receives, for example, at least one radio message FN via the reception antenna with a frequency/time/code component from at least one of the mobile stations MS1...MS5, whereas the mobile station MS1...MS5 receives, for example, at least one radio message FN with a frequency/time code component in the downstream direction (reception path) from at least one base station BTS1, BTS2 via the shared antenna ANT. The radio message FN is thereby composed of a carrier signal spread broad-band that has an information composed of data symbols modulated onto it.

The received carrier signal is filtered in a radio reception means FEE (receiver) and is mixed down onto an intermediate frequency that is in turn subsequently sampled and quantized. Following an analog/digital conversion, the signal, which has been distorted bu multipath propagation on the radio link, is supplied to an equalizer EQL that largely compensates the distortions (catchword: synchronization).

Subsequently, an attempt is made in a channel estimator KS to estimate the transmission properties of the transmission channel TRC on which the radio message FN has been transmitted. The transmission properties of the channel are thereby indicated in the time domain by the channel pulse response. So that the channel pulse response can be estimated, a specific auxiliary information in the form of what is referred to as a midamble fashioned as training information sequence is assigned or, respectively, allocated to the radio message FN at the transmission side (by the mobile

station MS1...MS5 or, respectively, by the base station BTS1, BTS2 in the present case).

In a data detector DD that follows thereupon and is shared by all received signals, the individual mobile station-specific signal parts contained in the shared signal are distortion-corrected and separated in a known way. After the distortion-correction and separation, the previously existing data symbols are converted into binary data in a symbol-to-data converter SDW. The original bit stream is subsequently acquired from the intermediate frequency in a demodulator DMOD before the individual time slots are allocated to the correct logical channels in a demultiplexer DMUX and, thus, to the different mobile stations as well.

The received bit sequence is decoded in a channel codec KC. Dependent on the channel, the bit information are allocated to the control and signalling time slot or to a voice time slot and – in the case of the base station (Figure 5) – the control and signalling data and the voice data for transmission to the base station controller BSC are handed over in common to an interface SS responsible for the signalling and voice encoding/decoding (voice codec), whereas – in the case of the mobile station (Figure 6) – the control and signalling data are handed over to a control and signalling unit STSE responsible for the complete signalling and control of the mobile station, and the voice data are handed over to a voice codec SPC designed for the voice input and output.

The voice data [...] in a predetermined data stream (for example, 64 kbit/s stream in network direction or, respectively, 13 kbit/s stream from network direction) in the voice codec of the interface SS in the base station BTS1, BTS2.

The complete control of the base station BTS1, BTS2 is implemented in a control unit STE.

Via the transmission antenna SAN, the base station BTS1, BTS2 sends, for example, at least one radio message FN with a frequency/time/code component to at least one of the mobile stations MS1...MS5 in the downstream direction (transmission path) via the transmission antenna, whereas the mobile station MS1...MS5 sends, for example, at least one radio message with a frequency/time/code component to at least

one base station BTS1, BTS2 in the upstream direction (transmission path) via the shared antenna ANT.

In Figure 5, the transmission path begins at the base station BTS1, BTS2 therewith that the base station controller BSC allocates control and signalling data as well as voice data received via the interface SS to a control and signalling time slot or to a voice time slot in the channel codec KC and these are encoded into a bit sequence channel-by-channel.

In Figure 6, the transmission path begins at the mobile station MS1...MS5 in that voice data received from the voice codec SPC and control and signalling data received from the control and signalling unit STSE are allocated to a control and signalling time slot or to a voice time slot in the channel codec KC and these are encoded into a bit sequence channel-by-channel.

The bit sequence acquired in the base station BTS1, BTS2 and in the mobile station MS1...MS5 is respectively converted into data symbols in a data-to-symbol converter DSW. Following thereupon, the data symbols are respectively spread with a respective, subscriber-individual code in a spreader means SPE. In the burst generator BG composed of a burst compiler BZS and a multiplexer MUX, a training information sequence in the form of a midamble for channel estimation is subsequently respectively attached to the spread data symbols in the burst compiler BZS, and the burst information obtained in this way is set to the respectively correct time slot in the multiplexer MUX. As a final step, the obtained burst is respectively modulated high-frequency in a modulator MOD and is converted digital-to-analog before the signal obtained in this way is beamed out – as radio message FN – to the transmission antenna SAN or, respectively, to the shared antenna ANT via a radio transmission means FSE (transmitter).

TDD telecommunication systems (**T**ime **D**ivision **D**uplex) are telecommunication systems wherein the transmission time frame composed of a plurality of time slots is divided -- preferably in the middle – for the downstream transmission direction (downlink) and the upstream transmission direction (uplink).

A TDD telecommunication system that comprises such a transmission time frame is, for example, the known DECT system [**D**igital **E**nhanced (previously:

European) **C**ordless **T**elecommunication; see *Nachrichtentechnik Elektronik 42 (1992) Jan./Feb., No. 1, Berlin, DE; U. Pilger, "Struktur des DECT-Standards" pages 23 through 29* **in combination with** the ETSI Publication *ETS 300175-1...9, October* 1992 and the DECT publication of *DECT-Forum, February 1997, pages 1 through 16*].

Figure 7 shows a DECT transmission time frame with a time duration of 10 ms composed of 12 downlink time slots and 12 uplink time slots. According to the DECT standard, a free time slot pair with a downlink time slot ZS_{DOWN} and an uplink time slot ZS_{UP} is selected for an arbitrary bidirectional telecommunication connection on a predetermined frequency in downstream transmission direction DL (downlink) and upstream transmission direction UL (uplink), whereby the spacing between the downlink time slot ZS_{DOWN} and the uplink time slot ZS_{UP} amounts to half the length (5 ms) of the DECT transmission time frame, likewise according to the DECT standard.

FDD telecommunication systems (**F**requency **D**ivision **D**uplex) are telecommunication systems wherein the time frame, composed of a plurality of time slots, is transmitted in a first frequency band for the downstream transmission direction (downlink) and in a second frequency band for the upstream transmission direction (uplink).

An FDD telecommunication system that transmits the time frame in this way is, for example, the known GSM system [**G**roupe **S**péciale **M**obile or **G**lobal **S**ystem for **M**obile Communication; see *Informatik Spektrum 14 (1991), June, No. 3, Berlin, DE; A. Mann, "Der GSM-Standard -- Grundlage für digitale europäische Mobilfunknetze", pages 137 through 152* **in combination with** the publication *telekom praxis 4/1993, P. Smolka "GSM-Funkschnittstelle -- Elemente und Funktionen", , pages 17 through 24*].

The radio interface for the GSM system recognizes a plurality of logical channels referred to as bearer services, thus, for example, an AGCH channel (**A**ccess **G**rant **CH**annel), a BCCH channel (**B**road**C**ast **CH**annel), an FACCH channel (Fast **A**ssociated **C**ontrol **CH**annel), a PCH channel (**P**aging **CH**annel), an RACH channel (**R**andom **A**ccess **CH**annel) and a TCH channel (**T**raffic **CH**annel) whose respective function in the radio interface is described, for example, in the publication *Informatik*

Spektrum 14 (1991), June, No. 3, Berlin, DE; A. Mann, "Der GSM-Standard -- Grundlage für digitale europäische Mobilfunknetze", pages 137 through 152 **in combination with** the publication *telekom praxis 4/1993, P. Smolka "GSM-Funkschnittstelle -- Elemente und Funktionen", , pages 17 through 24*. The GSM system also comprises a frame structure wherein the 13th time frame in every multi-frame having a length of 60 ms is fashioned as "idle" frame in the multi-frame. In this "idle" frame wherein no payload data are transmitted, the mobile stations in the GSM system are given the opportunity to implement various measurements, particularly measurements for pre-synchronization for possible handover procedures.

The greatest difference between the GSM system comprising a frequency and time level that is operated in a coordinated, licensed mode and the DECT system likewise comprising a frequency and time level that is operated in an uncoordinated, unlicenced mode is comprised in the way in which the physical resource "channel" is allocated to the system subscriber or, respectively, telecommunication subscriber.

In the coordinated, licenced telecommunication system, the channel allocation is controlled by a central entity, the network operator. This is possible because all mobile stations residing within a radio area of a base station use the same time base, i.e. are operated synchronously. The synchronous operation allows a clear definition of time slot boundaries and, thus, a clear separation of different telecommunication subscribers. Neighboring base stations need not be operate synchronously since the separation of channels that are used in neighboring radio cells generally ensues with a frequency planning in the frequency level. This type of channel allocation is called "fixed channel allocation (FCA)".

In the uncoordinated, unlicenced telecommunication system wherein such a central entity for the channel allocation is not present, the channels are initially dynamically selected -- "dynamic channel selection (DCS)" -- and then allocated. The frequency/time level thereby serves as platform or, respectively, "pool" both for the dynamic channel selection (DCS) as well as for the channel allocation. In such a system, the mobile part regularly monitors the frequency/time level and finally selects the frequency/time slot combination at which the transmission channel is disturbed least by occurring interference. In that neighboring base stations operating

uncoordinated and mobile parts are always asynchronous and the time bases therefore run into one another or, respectively, drift into one another, a situation often arises wherein the degree of interference reaches an unacceptable value. In this case, a handover of the telecommunication connection to a different channel, viz. a different frequency/time slot combination, must be initiated. This is called an "intra cell handover".

Since the WCDMA/FDD mode and the TDCDMA/TDD mode are to be utilized in common in the framework of the UMTS scenario (3rd mobile radiotelephone generation or, respectively, IMT-2000), the realization of a suitable handover procedure is indispensable, particularly for the above reasons, for telecommunication systems with wireless telecommunication between mobile and/or stationary transmission/reception devices based on code-division and time-division multiplex, in addition to an efficient dealing with the logical channels or, respectively, the bearer services (bearer handling).

For telecommunication systems with wireless telecommunication between mobile and/or stationary transmission/reception devices based on code-division and time-division multiplex, the object underlying the invention is comprised in specifying a method in the framework of a handover that enables the indication of a handover (handover indication) for different operating modes of the transmission/reception devices.

This object is respectively achieved by the features of patent claim 1.

The idea underlying the invention is comprised therein that -- according to claim 1 -- given telecommunication systems with wireless telecommunication between mobile and/or stationary transmission devices based on code-division and time-division multiplex and both in the TDD mode as well as in the FDD mode, a stationary transmission/reception device (BS) shuts off a broadcast signalling in an idle time-division multiplex frame of a multi-time frame, acquires an interference situation in a current telecommunication time slot pair by determining the noise power, compares a measured interference to a predetermined threshold. and, if the interference value is higher than or equal to the threshold, enters the interference value

in a channel selection list for a handover procedure and/or indicates a handover for the handover procedure.

Advantageous developments of the invention are recited in the subclaims.

An exemplary embodiment of the invention is explained with reference to Figures 8 through 10. These show:

Figure 8 a TDD time-division multiplex frame (modified) compared to the time frame in Figures 1 through 3 and the DECT transmission time frame in Figure 7 with respect to the plurality of time slots;

Figure 9 a channel allocation table for channels with a frequency, code and time-division multiplex component on the basis of the time-division multiplex frame according to Figure 8;

Figure 10 a message flowchart of a handover procedure.

Proceeding from the time frame in Figures 1 through 3 and the DECT transmission time frame in Figure 7, Figure 8 shows a (modified) TDD time-division multiplex frame ZMR with eight time slots ZS`1...ZS`8, whereby the first four time slots ZS`1...ZS`4 are provided for the downstream transmission direction DL, and the second four time slots ZS`5...ZS`8 are provided for the upstream transmission direction UL. The plurality of time slots has been reduced from "16" according to Figures 1 and 3 to "8" merely for presentation reasons for the channel allocation table in Figure 9 and has no limiting influence on the invention. On the contrary, the plurality of time slots can be varied more or less arbitrarily dependent on the telecommunication system, as can the other physical resources (for example, code, frequency, etc.).

On the basis of the time-division multiplex frame according to Figure 8, Figure 9 shows a channel allocation table for channels with a frequency-division, code-division and time-division multiplex component. The time-division multiplex component of this table covers the time slots ZS`1...ZS`8 with the TDD division according to Figure 8. The frequency-division multiplex component covers 12 frequencies FR1...FR12, whereas the code-division multiplex component contains 8 codes (pseudo-random signals) C1...C8.

Transmission path services fashioned as "bearer services", for example logical channels of the telecommunication system such as the control channel for signalling, the AGCH channel, the BCCH channel, the PCH channel, the RACH channel, the TCH channel and/or the FACCH channel that are required in the telecommunication system in the downstream direction and/or upstream direction are bundled on a first frequency FR1 in a code plane erected by the codes C1...C8. This bundling proves expedient for the aforementioned telecommunication systems because an unnecessary occupancy of time slots, i.e. of the resource "time", is thereby avoided.

Figure 9 shows a preferred embodiment according to which respectively all codes C1...C8 are preferably utilized for the bundling of said bearer services in a first time slot ZS`1 as a permanently prescribed (declared), first selection time slot on the first frequency in the downstream direction and in a fifth time slot ZS`5 as a permanently prescribed (declared), second selection time slot in the upstream direction. Of course, it is also possible to use fewer or, when more than these eight codes are available, more codes as well.

Given this bundling shown in Figure 9, for example, the codes C1...C8 are divided such in the first time slot ZS`1 that one code is reserved or, respectively, assigned for the control channel for the signalling and the AGCH channel, a further code is reserved or, respectively, assigned for the BCCH channel and the PCH channel, and the remaining six codes are reserved or, respectively, assigned for the TCH channel, whereas the codes C1...C8 in the fifth time slot ZS`5 are divided such that one code is reserved or, respectively, assigned for the RACH channel, a further code is reserved or, respectively, assigned for the FACCH channel for the handover indication and the remaining six codes are again reserved or, respectively, assigned for the TCH channel.

Over and above this, the spectral efficiency and/or the performance of the telecommunication system can be improved further when – as shown in Figure 9 – a respective plurality of bidirectional TDD telecommunication connections for which the physical resource "code, frequency, time" are respectively occupied partially the same and partially differently in downstream and upstream direction [...] for various connection scenarios, a first connection scenario VSZ1, a second connection scenario

VSZ2, a third connection scenario VSZ3, a fourth connection scenario VSZ4 and a fifth connection scenario VSZ5. For example, each connection scenario VSZ1...VSZ5 includes a first group of telecommunication connections G1, which is marked with a rising and falling hatching, and a second group of telecommunication connections G2 that is marked with a falling hatching. Each group thereby contains at least one bidirectional telecommunication connection.

In the first connection scenario VSZ1, the first group of telecommunication connections G1 on a second frequency FR2 occupies six codes – the first code C1, the second code C2, the third code C3, the fourth code C4, the fifth code C5 and the sixth code C6 – in downstream direction in a second time slot ZS`2 and in turn occupies the six codes C1...C6 in upstream direction in a sixth time slot ZS`6, whereas the second group of telecommunication connections G2 on the second frequency FR2 occupies the first code C1 in downstream direction in a fourth time slot ZS`4 and again occupies the first code C1 in upstream direction in an eighth time slot ZS`8.

The fourth time slot ZS`4 and the second time slot ZS`2 are downlink time slots ZS_{DOWN}, whereas the sixth time slot ZS`6 and the eighth time slot ZS`8 are uplink time slots ZS_{UP}.

For each telecommunication connection in the groups G1, G2, a first spacing AS1 between the downlink times slot ZS_{DOWN} and the uplink time slot ZS – according to the Prior Art (see Figure 7) – is as long as half the time-division multiplex frame ZMR. The spacing is thus a fraction of the length of the time-division multiplex frame ZMR, whereby the fraction has the value 0.5.

In the second connection scenario VSZ2, the first group of telecommunication connections G1 on a fourth frequency FR4 occupies the six codes C1...C6 in downstream direction in the fourth time slot ZS`4 and again occupies the six codes C1...C6 in upstream direction in the seventh time slot ZS`7, whereas the second group of telecommunication connections G2 on the fourth frequency occupies the codes C1...C4 in downstream direction in a second time slot ZS`2 and occupies the first code C1 and the second code C2 in upstream direction in the fifth time slot ZS`5.

The fourth time slot ZS`4 and the second time slot ZS`2 – as in the first connection scenario VSZ1 – are downlink time slots ZS_{DOWN}, whereas the seventh time slot ZS`7 and the fifth time slot ZS`5 are uplink time slots ZS_{UP}.

For each telecommunication connection in the groups G1, G2, a second spacing AS2 between the downlink times slot ZS_{DOWN} and the uplink time slot ZS is as long as a fraction (fractional distance) of the length of the time-division multiplex frame ZMR, whereby the fraction is dimensioned such and greater or smaller than the value 0.5 that the second spacing AS2 is fixed.

In the third connection scenario VSZ3, the first group of telecommunication connections G1 on a sixth frequency FR6 occupies the four codes C1...C4 in downstream direction in the second time slot ZS`2 and occupies the six codes C1...C6 as well as the seventh code C7 and the eighth code C8 in upstream direction on a fifth frequency FR5 in the eighth time slot ZS`8, whereas the second group of telecommunication connections G2 on the sixth frequency FR6 occupies the codes C1...C3 in downstream direction in the third time slot ZS`3 and occupies the codes C1...C4 in upstream direction in the fifth time slot ZS`5 on the fifth frequency FR5.

The second time slot ZS`2 and the third time slot ZS`3 are downlink time slots ZS_{DOWN}, whereas the eighth time slot ZS`8 and the fifth time slot ZS`5 are uplink time slots ZS_{UP}.

For each telecommunication connection in the groups G1, G2, a third spacing AS3 between the downlink time slot ZS_{DOWN} and the uplink time slot ZS is as long as a fraction (fractional distance) of the length of the time-division multiplex frame ZMR, whereby the fraction is respectively dimensioned such that the third spacing AS3 is variable.

In the fourth connection scenario VSZ4, the first group of telecommunication connections G1 on an eighth frequency FR8 occupies the first code C1 in downstream direction in the fourth time slot ZS`4 and occupies the seven codes C1...C7 in upstream direction on a ninth frequency FR9 in the sixth time slot ZS`9, whereas the second group of telecommunication connections G2 on the eighth frequency FR8 occupies the first code C1 in downstream direction in the third time

slot ZS`3 and occupies the first code C1 in upstream direction in the fifth time slot ZS`5 on the ninth frequency FR9.

The fourth time slot ZS`4 and the third time slot ZS`3 are downlink time slots ZS_{DOWN}, whereas the sixth time slot ZS`6 and the fifth time slot ZS`5 are uplink time slots ZS_{UP}.

For each telecommunication connection in the groups G1, G2, a fourth spacing AS4 between the downlink time slot ZS_{DOWN} and the uplink time slot ZS is as long as a fraction (fractional distance) of the length of the time-division multiplex frame ZMR, whereby the fraction is respectively dimensioned such that the fourth spacing AS4 is fixed.

In the fifth connection scenario VSZ5, the first group of telecommunication connections G1 on an eleventh frequency FR11 occupies the first code C1 and the second code in downstream direction in the fourth time slot ZS`4 and again occupies the first code C1 and the second code C2 in upstream direction in the fifth time slot ZS`5, whereas the second group of telecommunication connections G2 on the eleventh frequency FR11 occupies the codes C1...C5 in downstream direction in the first time slot ZS`1 and occupies the codes C1...C5 in upstream direction in the eighth time slot ZS`8.

The fourth time slot ZS`4 and the first time slot ZS`1 are downlink time slots ZS_{DOWN}, whereas the fifth time slot ZS`5 and the eighth time slot ZS`8 are uplink time slots ZS_{UP}.

For each telecommunication connection in the groups G1, G2, a fifth spacing AS5 between the downlink time slot ZS_{DOWN} and the uplink time slot ZS is as long as a fraction (fractional distance) of the length of the time-division multiplex frame ZMR, whereby the fraction is dimensioned such that the second [sic] spacing AS2 is variable.

Figure 10 shows a message flowchart of a handover procedure. The handover procedure is fundamentally composed of three phases, a first phase that is referred to as a handover indication, a second phase that is referred to as a handover initiation, and a third phase that is referred to as a handover execution, these being executed in the indicated sequence.

In case of a deterioration of the quality of service (QoS), a base station BS indicates a handover, i.e. a first phase of the handover procedure is started. Alternatively, the deterioration of the quality of service (QoS) can also have been detected by a mobile part, a first mobile part MT1, a second mobile part MT2 or an n^{th} mobile part MTn, that subsequently informs the base station BS of this deterioration, for example via the FACCH channel. In this case, the base station BS is the "master" with respect to the handover procedure, whereas the mobile part MT1...MTn is the "slave". However, it is also possible that the mobile part is the "master" with respect to the handover procedure and the base station is the "slave".

With the indication of a handover by the base station BS, this selects a "handover" time slot pair, for example on the basis of a channel selection list, wherein the quality of the service to be transmitted is better than in the existing telecommunication time slot pair. The "handover" time slot pair has already been determined in the first phase of the handover procedure, the handover indication.

The channel selection list is produced in the framework of the dynamic channel selection (DCS). To that end, the base station BS shuts off the signalling on the BCCH channel, acquires the interference situation in the GSM-specific "idle" frame by determining the noise power, for example by measuring the signal field strength, in the telecommunication time slot pair and stores the measured results (interference values) in the channel selection list. So that any old handover procedures are not constantly implemented on the basis of entries in the channel selection list (catchword: hysteresis effect), a threshold is defined that lies between the respectively currently acquired interference value and an interference value that belongs to the "quietest" time slot pair. The base station BS should not undertake an entry into the channel selection list and/or not indicate or initiate a handover when the predetermined threshold is not exceeded by the respectively acquired interference value.

The second phase of the handover procedure, the handover initiation, begins therewith that the base station BS sets up a BCCH channel in the downlink time slot of the handover time slot pair. In the traffic mode, the information (data services) sent

on the downlink time slot of the telecommunication time slot pair are simultaneously transmitted on this downlink time slot of the handover time slot pair.

Differing from the traffic mode, a simultaneous transmission of the information (data services) does not occur in the broadcast mode, wherein the second phase of the handover procedure is started in the same way.

After the successful setup of the BCCH channel in the downlink time slot of the handover time slot pair, the base station BS transmits a first message "Handover Request" M1 via the BCCH channel in the downlink time slot of the telecommunication time slot pair to the mobile parts MT1...MTn connected to the base station BS via this channel. The mobile parts MT1...MTn are informed of the position of the handover time slot pair with this first message M1. After the transmission of the first message M1, the base station BS continues the simultaneous transmission of the information (data services) in the downlink time slots of the telecommunication time slot pair and of the handover time slot pair and also transmits the first message M1 on the BCCH channel in the downlink time slots of the telecommunication time slot pair until all mobile parts MT1...MTn connected to the base station BS have acknowledged the initiation of the handover by the first message M1.

When the affected mobile parts MT1...MTn still have current data to transmit, the mobile parts MT1...MTn connected to the base station BS switch immediately from the telecommunication time slot pair to the handover time slot pair after receiving the first message M1. The data transmission in the telecommunication time slot pair is thereby ended and seamlessly continued in the handover time slot pair.

When, however, the affected mobile parts MT1...MTn still have current data to transmit, then the respective mobile part MT1...MTn transmits a second message "Handover Confirm" M2 to the base station BS on a signalling channel.

The base station BS thus receives, on the one hand, simultaneous data in the telecommunication time slot pair and the handover time slot pair and, on the other hand, the second message M2. The initiation of the handover by the first message M1 is ultimately viewed by the base station BS as having been confirmed when -- in the former instance -- the data transmitted from the respective mobile part MT1...MTn on

the uplink time slot of the handover time slot pair are received error-free by the base station or when -- in the latter instance -- the base station BS receives the second message M2.

The second phase of the handover, the handover initiation, is ended when all mobile parts MT1...MTn have confirmed the initiation of the handover by the first message M1.

In the third phase of the handover procedure, the handover execution, the transmission in the previous telecommunication time slot pair is ended in conclusion after all mobile parts MT1...MTn have confirmed the initiation of the handover by the first message M1; the handover time slot pair thus serves as new telecommunication time slot pair.

Patent Claims

1. Method for controlling the handover of telecommunication connections in telecommunication systems with wireless telecommunication between mobile and/or stationary transmission/reception devices based on code-division and time-division multiplex, whereby

(a) carrier frequencies (FR1...FR12) predetermined for the telecommunication system are respectively divided such into a plurality of time slots (ZS`1...ZS`8) having a respectively predetermined time slot duration (T_{ZS}) that the telecommunication system can be operated in the TDD mode, whereby the time slots (ZS`1...ZS`8) per carrier frequency (FR1...FR2) respectively form a time-division multiplex frame (ZMR);

(b) at most a predetermined plurality of bidirectional telecommunication connections in upstream and downstream direction between the telecommunication subscribers of the mobile transmission/reception devices (MS1...MS5) and/or stationary transmission/reception devices (BTS1, BTS2) of the telecommunication can be simultaneously set up in the time slots (ZS`1...ZS`8) or, respectively, the frequency ranges of the telecommunication system, whereby subscriber signals thereby transmitted are operated for separability with pseudo-random signals (C1...C8), what are referred to as the codes, individually allocated to the subscribers;

characterized in that

a stationary transmission/reception device (BS) shuts off a broadcast signalling in an idle time-division multiplex frame of a multi-time frame, acquires an interference situation in a current telecommunication time slot pair by determining the noise power, compares a measured interference to a predetermined threshold. and, if the interference value is higher than or equal to the threshold, enters the interference value in a channel selection list for a handover procedure and/or indicates a handover for the handover procedure.

2. Method according to claim 1, characterized in that the determination of the noise power ensues by measuring the field strength.

3. Method according to claim 1 or 2, characterized in that

(a) a handover time slot pair is identified by a stationary transmission/reception device (BS) during a first phase of a handover procedure, the handover indication;

(b) during a second phase of the handover procedure, the handover initiation,

(b1) the stationary transmission/reception device (BS) sends a first message "Handover Request" (M1) to mobile transmission/reception devices (MT1...MTn) allocated to the stationary transmission reception device (BS) with which the stationary transmission/reception device (BS) informs the mobile transmission/reception devices (MT1...MTn) of the handover time slot;

(b2) the stationary transmission/reception device (BS) sends the first message "Handover Request" (M1) to the mobile transmission/reception devices (MT1...MTn) until all mobile transmission/reception devices (MT1...MTn) allocated to the stationary transmission/reception device (BS) have confirmed the initiation of the handover by the first message (M1);

(c) the handover procedure is ended during a third phase of the handover procedure, the execution of a handover.

4. Method according to claim 3, characterized in that the first message (M1) is confirmed by a second message (M2).

5. Method according to claim 3, characterized in that the first message (M1) is confirmed in that the mobile transmission/reception devices (MT1...MTn) immediately transmit data to be transmitted in the handover time slot pair.

6. Method according to one of the claims 1 through 5, characterized in that transmission path services fashioned as bearer services that are required in downstream and/or upstream direction in the telecommunication system are bundled in a code level erected by the codes (C1...C8).

7. Method according to claim 6, characterized in that least a part of logical channels of the telecommunication system -- for example, the control channel for signalling, the AGCH channel, the BCCH channel, the PCH channel, the RACH channel, the TCH channel and/or the FACCH channel -- is bundled in the code level as bearer services.

8. Method according to claim 6 or 7, characterized in that the bundling occurs in a first selection time slot (ZS'1) in downstream direction and in a second selection time slot (ZS'5) in upstream direction.

9. Method according to claim 8, characterized in that a first time slot (ZS'1) of the time slots (ZS'1...ZS'8) is allocated to the first selection time slot (ZS'1) and a fifth time slot (ZS'5) of the time slots (ZS'1...ZS'8) is allocated to the second selection time slot (ZS'5).

10. Method according to one of the claims 1 through 9, characterized in that a time slot pair, a downlink time slot (ZS'_{DOWN}) and an uplink time slot (ZS'_{UP}), is selected such in the TDD mode for each telecommunication connection that the spacing (AS2...AS5) between the downlink time slot (ZS'_{DOWN}) and the uplink time slot (ZS'_{UP}) that are allocated to the same carrier frequency (FR1...FR12) or different carrier frequencies (FR1...FR12) is a fraction of the length of a time-division multiplex frame (ZMR), whereby the spacing (AS2...AS5) is fixed or variable.

Abstract

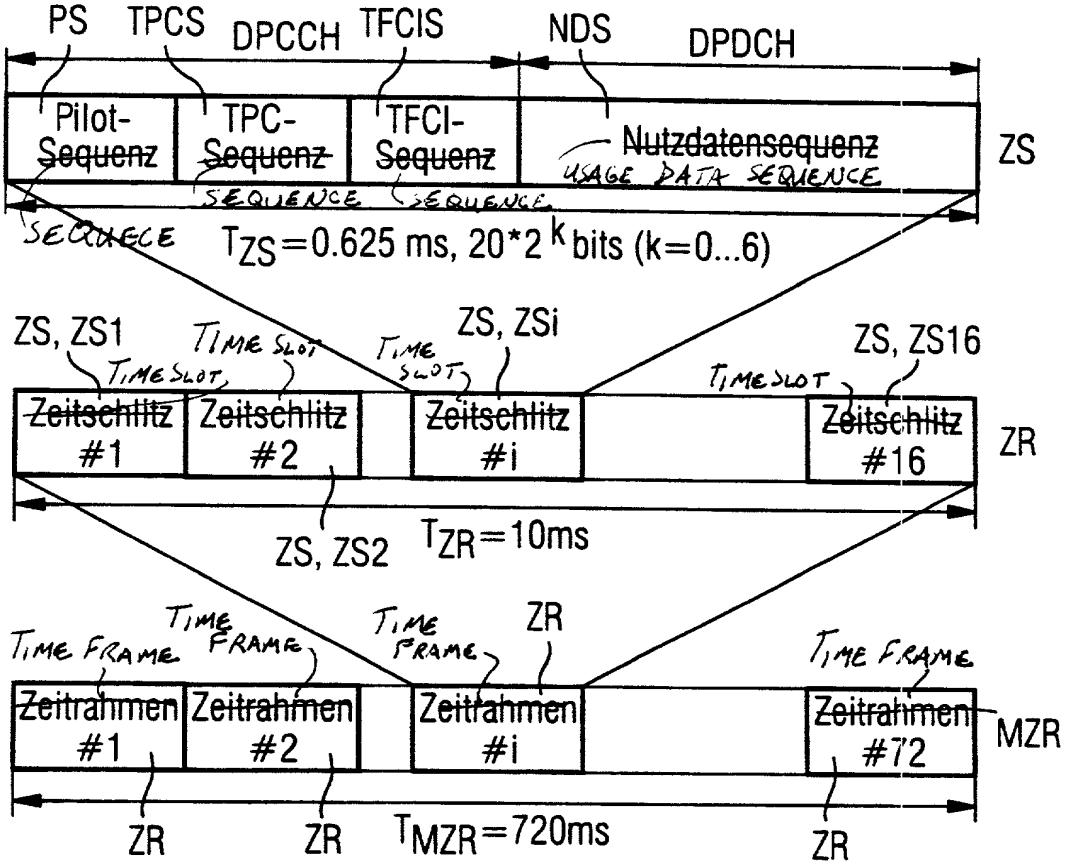
Telecommunication Systems with Wireless Telecommunication Between Mobile and/or Stationary Transmission/Reception Devices Based on Code-Division and Time-Division Multiplex

In order to reliably enable a handover indication for different operating modes of the transmission/reception devices for telecommunication systems with wireless telecommunication between mobile and/or stationary transmission/reception devices based on code-division and time-division multiplex, a stationary transmission/reception device (BS) is fashioned such that a broadcast signalling in an idle time-division multiplex frame of a multi-time frame is shut off both in the TDD mode as well as in the FDD mode, an interference situation in a current telecommunication time slot pair is acquired by determining the noise power, a measured interference value is compared to a predetermined threshold. and, if the interference value is higher than or equal to the threshold, the interference value is entered in a channel selection list for a handover procedure and/or a handover for the handover procedure is indicated.

Figure 10

~~#8~~

FIG 1


PS
TPCS
DPCCH
TFCIS
NDS
DPDCH
Pilot-Sequenz
TPC-Sequenz
TFCI-Sequenz
Nutzdatensequenz
USAGE DATA SEQUENCE
ZS
SEQUENCE
SEQUENCE
SEQUENCE
T_{ZS}=0.625 ms, 20*2 k bits (k=0...6)
ZS, ZS1
TIME SLOT
TIME SLOT
ZS, ZSi
TIME SLOT
ZS, ZS16
Zeitschlitz #1
Zeitschlitz #2
Zeitschlitz #i
Zeitschlitz #16
ZR
ZS, ZS2
T_{ZR}=10ms
TIME FRAME
TIME FRAME
TIME FRAME
ZR
TIME FRAME
Zeitrahmen #1
Zeitrahmen #2
Zeitrahmen #i
Zeitrahmen #72
MZR
ZR
ZR
T_{MZR}=720ms
ZR

~~2/6~~

FIG 2

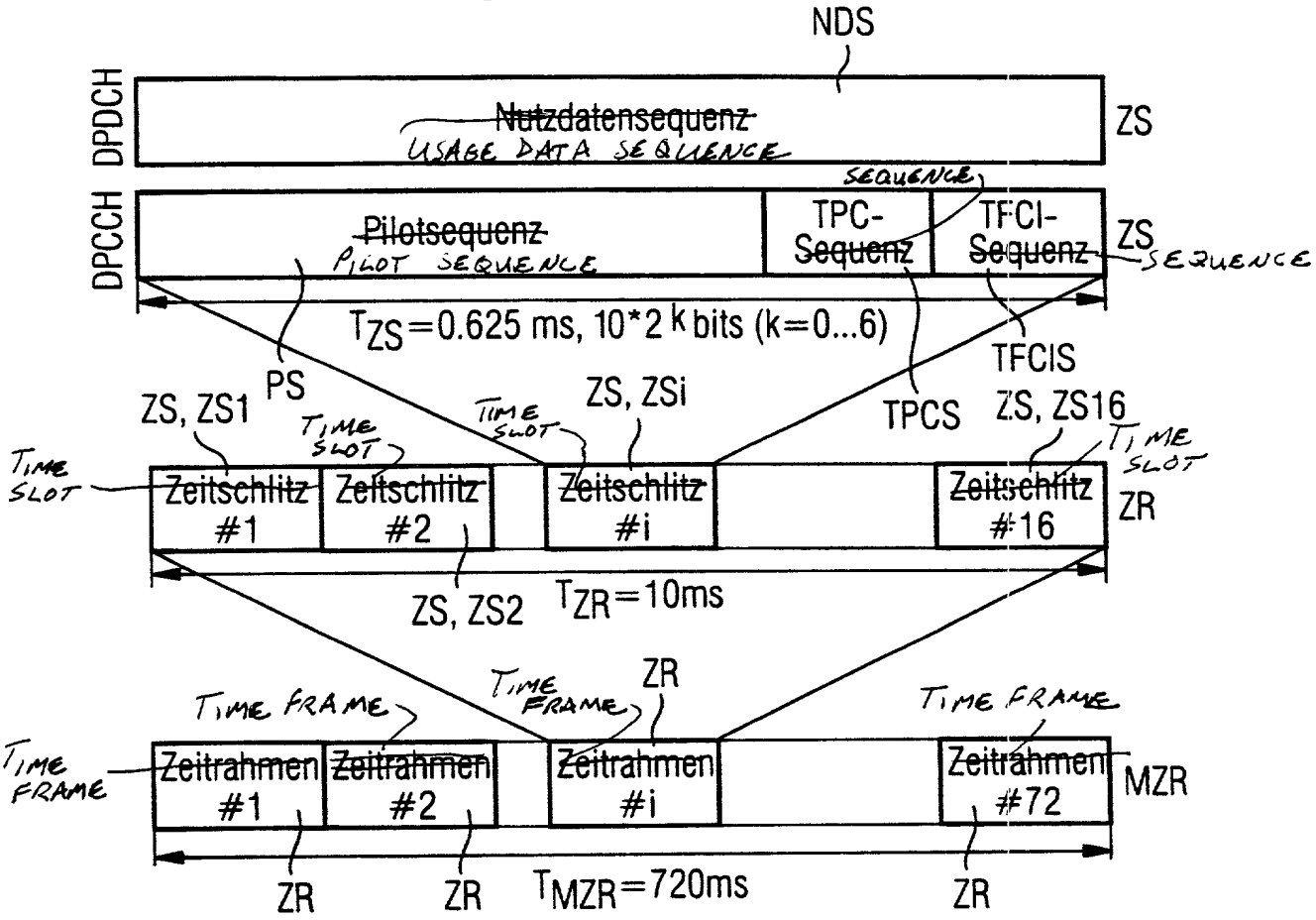
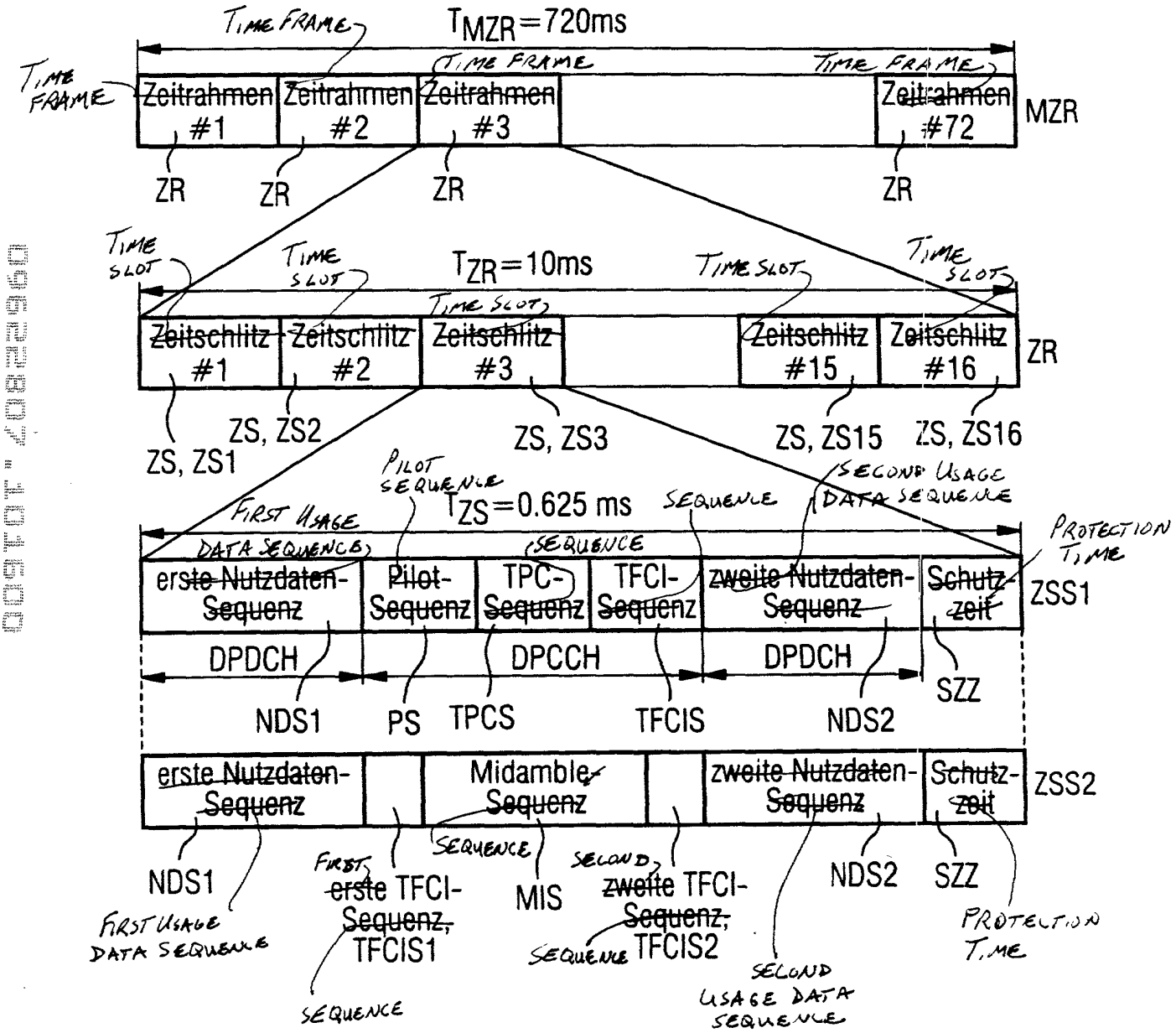
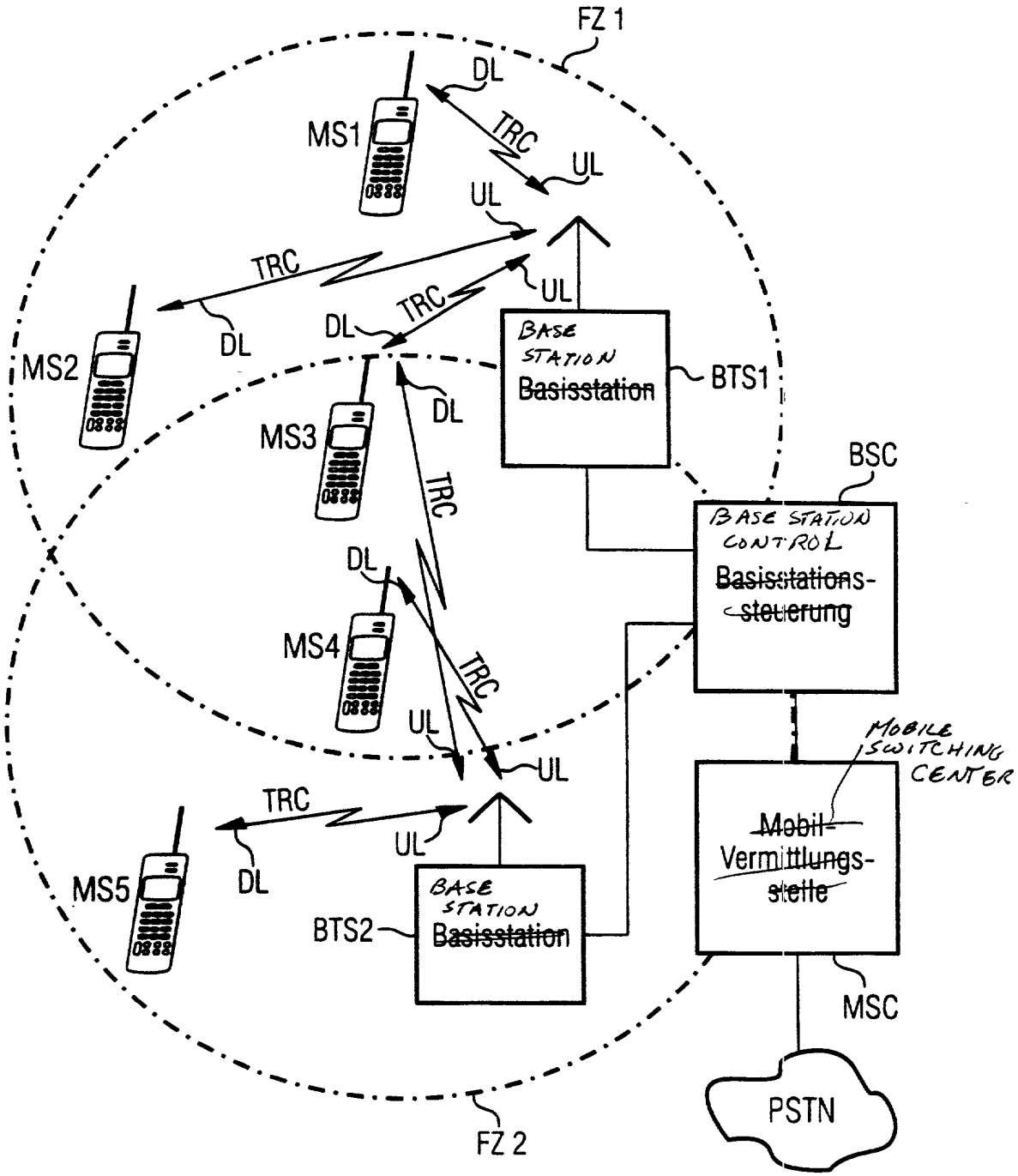


FIG 3


TIME FRAME
TMZR=720ms
TIME FRAME
TIME FRAME
TIME FRAME
Zeitrahmen #1
Zeitrahmen #2
Zeitrahmen #3
Zeitrahmen #72
MZR
ZR
ZR
ZR
ZR
TIME SLOT
TIME SLOT
TZR=10ms
TIME SLOT
TIME SLOT
TIME SLOT
Zeitschlitz #1
Zeitschlitz #2
Zeitschlitz #3
Zeitschlitz #15
Zeitschlitz #16
ZR
ZS, ZS1
ZS, ZS2
ZS, ZS3
ZS, ZS15
ZS, ZS16
PILOT SEQUENCE
TZS=0.625 ms
SECOND USAGE DATA SEQUENCE
FIRST USAGE DATA SEQUENCE
SEQUENCE
SEQUENCE
PROTECTION TIME
erste Nutzdaten-Sequenz
Pilot-Sequenz
TPC-Sequenz
TFCI-Sequenz
zweite Nutzdaten-Sequenz
Schutz-zeit
ZSS1
DPDCH
DPCCH
DPDCH
SZZ
NDS1
PS
TPCS
TFCIS
NDS2
erste Nutzdaten-Sequenz
Midamble-Sequenz
zweite Nutzdaten-Sequenz
Schutz-zeit
ZSS2
NDS1
FIRST USAGE DATA SEQUENCE
FIRST erste TFCI-Sequenz, TFCIS1
SEQUENCE
MIS
SEQUENCE
SECOND zweite TFCI-Sequenz, TFCIS2
SECOND USAGE DATA SEQUENCE
NDS2
SZZ
PROTECTION TIME

~~#8~~

FIG 4



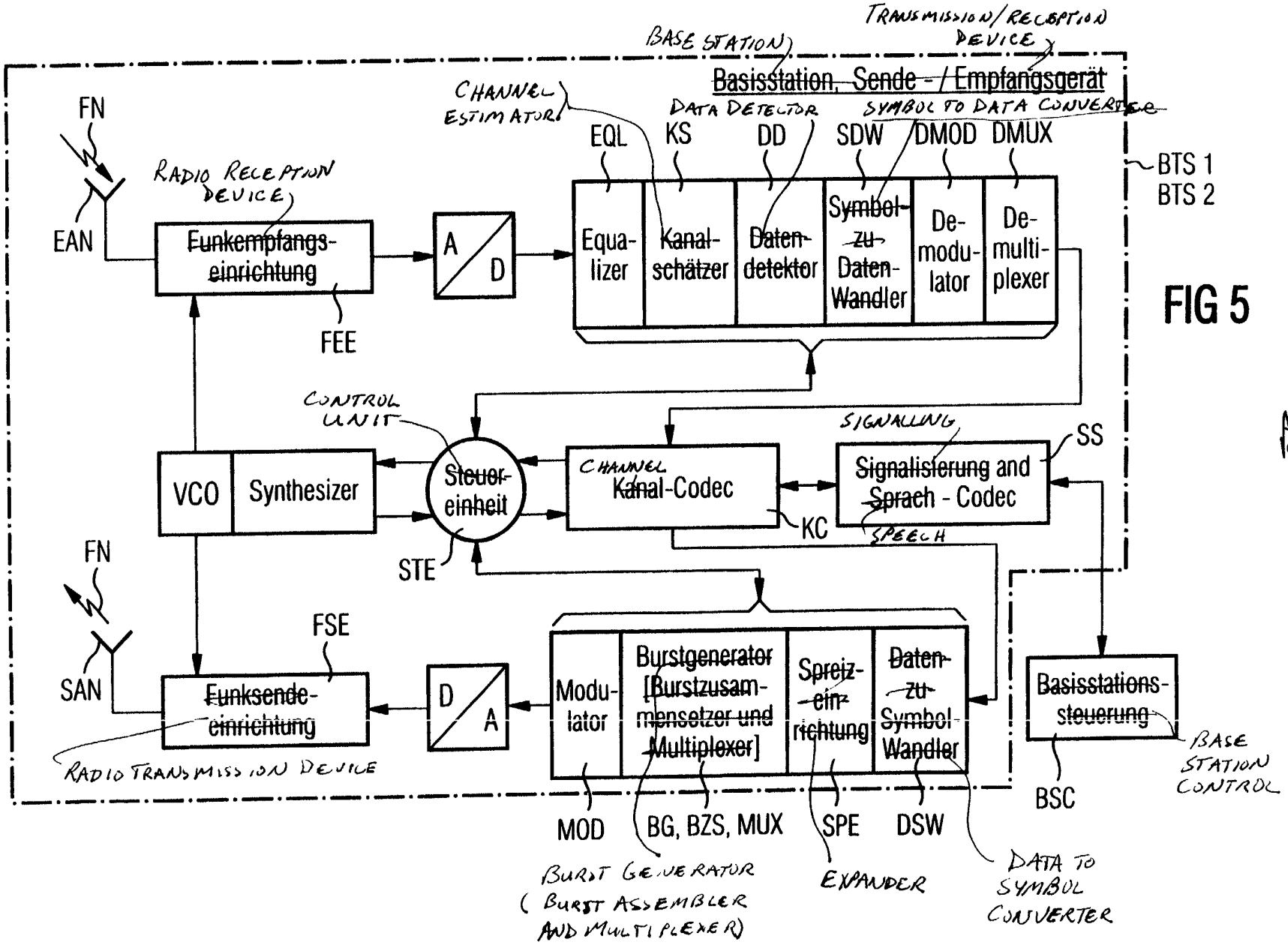


FIG 5

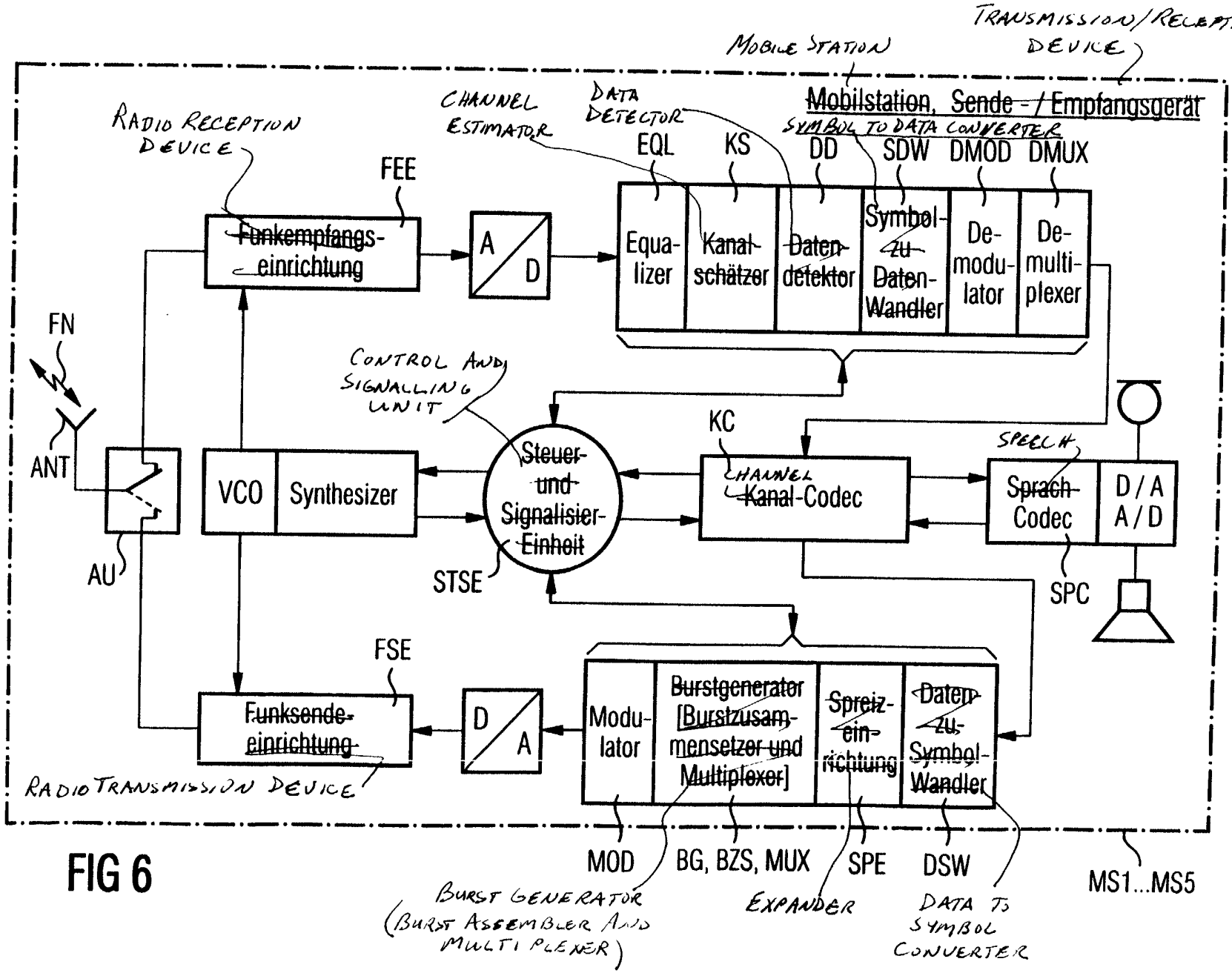


FIG 6

~~FIG~~

FIG 7

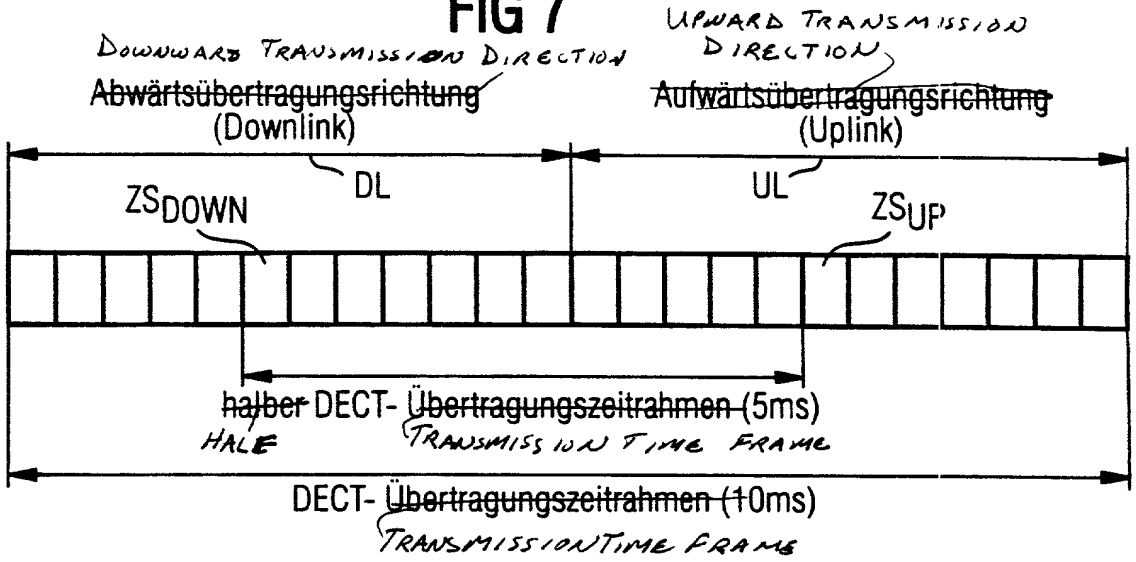
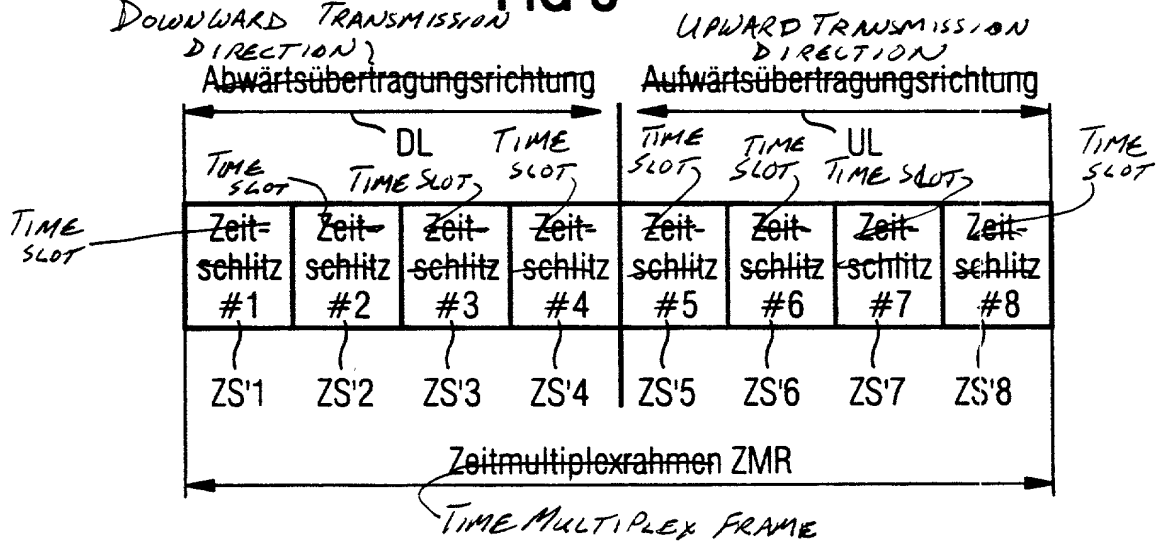


FIG 8



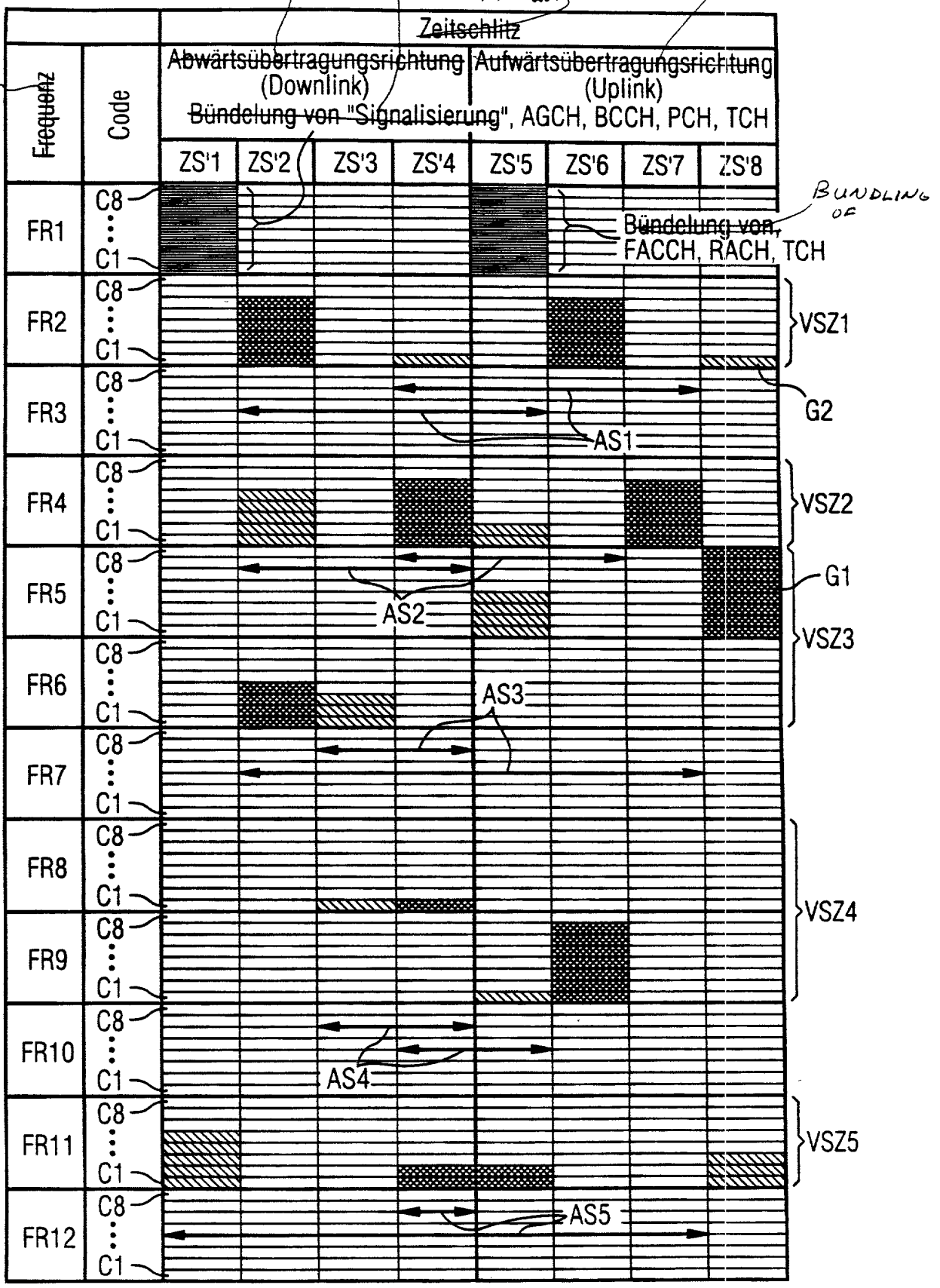
DOWNWARD TRANSMISSION DIRECTION

BUNDLING OF SIGNALLING

UPWARD TRANSMISSION DIRECTION

TIMESLOT

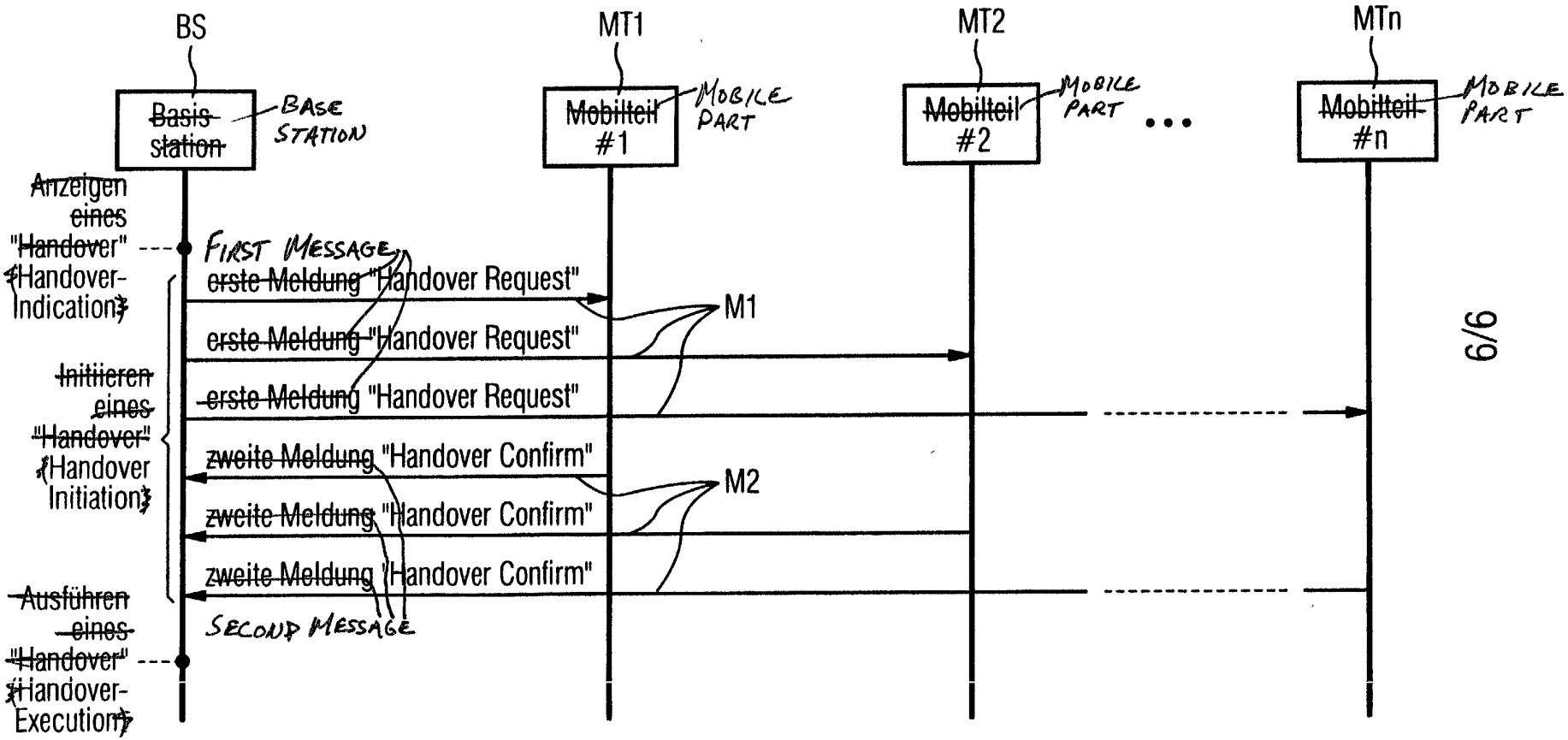
FIG 9



FREQUENCY

BUNDLING OF

FIG 10



Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprunglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und fur den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Telekommunikationssysteme mit drahtloser, auf Code- und Zeitmultiplex basierender Telekommunikation zwischen mobilen und/oder stationären Sende-/Empfangsgeräten

deren Beschreibung

(zutreffendes ankreuzen)

☒ hier beigefügt ist.

☐ am _____ als PCT internationale Anmeldung PCT Anmeldungsnummer _____ eingereicht wurde und am _____ abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

(check one)

☐ is attached hereto.

☐ was filed on _____ as PCT international application PCT Application No. _____ and was amended on _____ (if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Prioritat beansprucht

			Priority Claimed	
98103507.4	Germany (EP)	27. Februar 1998	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein

Ich beanspruche hiermit gemass Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhangig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklarung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsatzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwalte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschafte vor dem Patent- und Warenzeichenamt *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Messrs. John D. Simpson (Registration No. 19,842) Lewis T. Steadman (17,074), William C. Stueber (16,453), P. Phillips Connor (19,259), Dennis A. Gross (24,410), Marvin Moody (16,549), Steven H. Noll (28,982), Brett A. Valiquet (27,841), Thomas I. Ross (29,275), Kevin W. Guynn (29,927), Edward A. Lehmann (22,312), James D. Hobart (24,149), Robert M. Barrett (30,142), James Van Santen (16,584), J. Arthur Gross (13,615), Richard J. Schwarz (13,472) and Melvin A. Robinson (31,870), David R. Metzger (32,919), John R. Garrett (27,888) all members of the firm of Hill, Steadman & Simpson, A Professional Corporation

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Voller Name des zweiten Miterfinders (falls zutreffend): SCHWARK, Uwe	Full name of second joint inventor, if any:
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(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).